Contribution ID: **24** Type: **Poster**

Grey Tracks as probes of Hadronization Dynamics

Wednesday, 29 June 2022 15:08 (1 minute)

Energetic quarks liberated from hadrons in nuclear deep-inelastic scattering propagate through the nuclear medium, interacting with it via several processes. These include quark energy loss through medium-stimulated gluon bremsstrahlung and intra-nuclear interactions of forming hadrons. One manifestation of these interactions is enhanced emission of low-energy charged particles, referred to as grey tracks.To make use of the theoretical components of the BeAGLE event generator to interpret grey track signatures of parton transport and hadron formation by comparing its predictions to E665 data. We extend the base version of BeAGLE by upgrading the PyQM module, which now offers four different options for the description of parton energy loss to the existing complement of hadronic and prehadronic interactions inside nuclei. The E665 data we used consist of multiplicity ratios for fixed-target scattering of 490 GeV muons on gaseous Xe normalized to liquid D as a function of the number of grey tracks produced. We compare multiplicity ratios for E665 grey tracks, which are defined as charged particles with momenta between 200 and 600 MeV/c and greater energy loss in detector materials than a minimum ionizing particle, to the predictions of BeAGLE, varying the PyQM options and parameters to determine which physics phenomena can be identified by these data. We divide the data into charge and rapidity classes for all charged hadrons, which have an average momentum of 5 GeV with a high-energy tail extending to nearly the beam energy.The BeAGLE predictions for forward rapidities ($y>2$ in the virtual photon-nucleon center of mass frame) agree with the E665 data for up to 2-4 grey tracks per event. Beyond that range, BeAGLE overpredicts the charged particle multiplicity ratios for all PyQM options in comparison to the data. For backward rapidities ($y<-1$), BeAGLE underpredicts multiplicity ratios for positively charged particles, which are primarily protons, while providing an excellent description of negatively charged particles. In BeAGLE we find that grey tracks are unaffected by modifications of the forward production, thus their production must be dominated by interactions with hadrons in the backward region, where they are much more numerous. We see a strong correlation between the number of grey tracks and the in-medium pathlength. This offers the advantage that a selection of certain particles in the forward region is unlikely to bias a centrality selection. Our energy loss model does not reproduce the suppression observed in the projectile region, even with rather large $\hat{q}$. These results lay an important foundation for future spectator tagging studies at the Electron Ion Collider, where both neutron and proton grey track studies will be feasible down to very small momenta.

Primary author: ROBLES GAJARDO, Carolina (Universidad Técnica Federico Santa María)

Session Classification: Posters